

## Physics 8A: Mon Sept 30

Review From Last Time:

- In one dimension, work done on an object

$$W = F_x \Delta x$$

measured in joules (J)

$$1 \text{ J} = 1 \text{ Nm}$$

- In three dimensions

$$W = \vec{F} \cdot \Delta \vec{r}$$

where “dot product” or “scalar product” is defined

$$\vec{A} \cdot \vec{B} = |\vec{A}| |\vec{B}| \cos \theta \quad (1)$$

$$= A_x B_x + A_y B_y + A_z B_z \quad (2)$$

where  $\theta$  is the angle between  $\vec{A}$  and  $\vec{B}$

- Only component of the force along (or opposite) the direction of motion does work
  - Work done *by* gravity:
    - $-mg(y_f - y_i)$  independent of path
  - Work done *to oppose* gravity:
    - $+mg(y_f - y_i)$  independent of path
- If the force is not constant, divide path into segments and integrate
  - In one dimension

$$W = \int_{x_i}^{x_f} F_x(x) dx$$

- In three dimensions

$$W = \int_{\vec{r}_i}^{\vec{r}_f} \vec{F}(\vec{r}) \cdot d\vec{r}$$

- Example: For spring with spring constant  $k$  work done on the spring is:

$$W = \frac{1}{2}k(x_f^2 - x_i^2)$$

Today Wolfson 6.2-6.4

Wed Wolfson 7.1-7.3